

WHAT IS CLAIMED IS:

Sub A1

1. An apparatus for printing graphical information on a surface, the apparatus comprising:

 a print head for printing indicia on the surface;

 an image sensor for recording an image of the surface, wherein the recorded image contains a position-coding pattern that identifies a position on the surface; and

 a processor for converting the recorded image into a recorded position, wherein the print head prints indicia on the surface based on a comparison of the recorded position with the graphical information to be printed.

2. The apparatus of claim 1, wherein the graphic information is at least one of the following: textual information or non-textual image information.

3. The apparatus of claim 1, further including:

 a memory for storing the graphic information in the form of a plurality of graphics positions.

4. The apparatus of claim 3, further including:

 a processor for receiving graphic information and converting the received graphic information into the plurality of graphics positions.

5. The apparatus of claim 4, wherein the processor transforms the graphics positions in the graphic information in response to an input signal containing transformation information.

Sub A2

6. The apparatus of claim 5, wherein the input signal is a start position recorded by the image sensor and coded in the position-coding pattern, such that one of the graphics positions corresponds to the recorded start position.

7. The apparatus of claim 1, wherein the recorded position is defined by two coordinate values.

8. The apparatus of claim 1, wherein the graphic information corresponds to a plurality of graphics positions, and wherein the print head prints indicia on the surface when the recorded position corresponds to a graphics position in the graphic information.

9. The apparatus of claim 1, wherein the processor determines a predicted position of the print head from the recorded position, and wherein the print head prints indicia when the predicted position corresponds to a graphics position in the graphic information.

10. The apparatus of claim 9, wherein the processor determines a speed and a direction of the print head in relation to the surface based on at least two recorded positions determined from at least two recorded images, and wherein the processor calculates the predicted position based on the recorded positions and the speed and direction of the print head.

11. The apparatus of claim 10, wherein the processor determines whether the speed of the print head in relation to the surface is constant, and wherein the processor terminates printing by the print head when the speed is changing in an amount greater than a predetermined acceleration threshold value.

12. The apparatus of claim 1, wherein the processor determines a speed and a direction of the print head in relation to the surface based on at least two recorded positions converted from at least two recorded images.

13. The apparatus of claim 12, wherein the processor:

- identifies a predetermined number of symbols in the position-coding pattern in the recorded image;
- determines a first position code for a first coordinate and a second position code for a second coordinate by translating each symbol of the position coding pattern into a first digit for the first position code and into a second digit for the second position code; and
- determines the first coordinate based on the first position code and determines the second coordinate based on the second position code.

14. The apparatus of claim 1, wherein the printer is a handheld device.

15. The apparatus of claim 1, wherein the image sensor has a main viewing direction for recording images on the surface, wherein the processor determines an angle of the viewing direction with respect to the surface based on the recorded image, and wherein the print head prints indicia according to the determined angle.

16. The apparatus of claim 1, wherein the print head and the image sensor are located in proximity to one another such that the print head prints indicia on the surface at substantially the same point on the surface where the image sensor records the image.

17. The apparatus of claim 1, wherein the print head comprises a nozzle that prints indicia by dispensing ink on the surface.

18. The apparatus of claim 17, wherein the nozzle dispenses dye in a plurality of directions.

19. The apparatus of claim 1, wherein the print head comprises a heater that prints the indicia by heating the surface.

20. A system for printing graphic information on a surface having a position-coding pattern thereon, wherein an arbitrary subset of the position coding pattern defines a coordinate position on the surface, the system comprising:

a print head for printing indicia on the surface; and

an image sensor for recording an image of the surface,

wherein the print head prints indicia on the surface based on a comparison of the graphic information with the coordinate position defined by position-coding pattern in the recorded image.

21. The system of claim 20, further including a processor for determining a speed of the print head in relation to the surface, and wherein the processor terminates printing by the print head when the speed is changing in an amount greater than a predetermined acceleration threshold value.

Sub
a3

Sub
a4

22. A method for printing graphic information on a surface, comprising:
recording an image of the surface; and
printing indicia on the surface based on a comparison of the recorded image and the
graphic information.

00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

23. An apparatus for printing graphical information on a surface, the apparatus comprising:

a nozzle for dispensing dye on the surface;

an image sensor for recording an image of the surface, wherein the recorded image contains a position-coding pattern that codes a position on the surface; and

a processor for converting the recorded image into a recorded position, wherein the processor determines a predicted position of the nozzle based on the recorded position, and wherein the nozzle dispenses dye on the surface when the predicted position corresponds to a graphics position in the graphical information.

24. An apparatus for printing graphical information on a surface, the apparatus comprising:

a print head for printing indicia on the surface;

an image sensor for recording an image of the surface, wherein the recorded image contains a position-coding pattern that codes a position on the surface; and

a processor for converting the recorded image into a recorded position, wherein the processor determines a predicted position of the print head based on the recorded position, and wherein the print head prints the indicia on the surface when the predicted position corresponds to a graphics position in the graphical information.

Sur A4

25. A system for printing graphical information, comprising:

a printing surface having a position-coding pattern thereon, wherein an arbitrary subset, having a predetermined size, of the position-coding pattern identifies a unique position on the printing surface; and

a printing unit for printing the graphic information on the printing surface, wherein the printing unit further includes:

a print head for printing indicia on the printing surface; and

an image sensor for recording an image of the arbitrary subset on the printing surface,

wherein the print head prints indicia on the surface based on a comparison of the identified unique position on the printing surface with the graphical information to be printed.

26. The system of claim 25, further including a processor for determining a speed of the print head in relation to the surface, and wherein the processor terminates printing by the print head when the speed is changing in an amount greater than a predetermined acceleration threshold value.

*Sub
05*

27. A hand-held printing device configured to print as the device is moved over a surface upon which is recorded a pattern, the hand-held printing device comprising:

- a housing configured to be held by a user;
- a print head in the housing;
- a sensor in the housing for reading the pattern;
- a processor for determining, as the housing is moved over the surface, a location on the surface based on the pattern read by the sensor, and for causing the print head to print based upon the determined location.

0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100